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ABSTRACT

The study of demography must begin with an understanding of the three sources of population changes: fertility, mortality, and migration. This paper leads prospective demographers--or anyone interested in population--through the dynamics of these three variables, introducing them to the forces that cause populations to grow or decline, and that determine the age, sex, or ethnic composition of a society. The effects of fertility, mortality, and migration in changing the geographic distribution of people in the world and in the United States are studied. The unprecedented global population growth that has occurred within the past few centuries is noted, as well as the prospects for future growth. Finally, the many critical population-related issues facing the world today are surveyed. A list of discussion questions concludes this document. (Author/DB)

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Population: A Lively Introduction

by Joseph A. McFalls, Jr.

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> *The study of population offers something for everyone: the daily dramas of sex and death, politics and war; the interlacings of individuals in all their collectivities; the confrontations of nature and civilization, [of] statistics and diaries, [of] self-interest and altruism.*[1]
>
> —*Samuel H. Preston*

Most people think demography is just math in disguise—a sort of dry social accounting. Once exposed to the subject many change their minds. They come to appreciate the profound impact demographic forces have on societies. This has never been more true than during the past half-century, a period in which the United States and other societies have experienced unprecedented social and demographic change. Since these demographic forces have not been stilled, they will continue to cause social change and to shape social programs for the balance of our lives and beyond.

People also find demography fascinating because it deals with so many personally relevant topics. Nearly all the major events of people's lives have demographic implications: birth, schooling, marriage, occupation, childbearing, retirement, and death. Consider the following questions:

- When and where were you born? How many others were born the same year?
- What is your probability of getting married or divorced?
- Do you have children or do you ever plan to? How many, and how far apart?
- How many jobs will you have? What kind? What are your chances of promotion? When will you retire?
- How many times will you move? Where are you likely to go?
- How long will you live? What are the chances of your dying within a year? Within ten years? What is likely to kill you?

These are all in part demographic questions. Indeed, if people are not interested in demographic phenomena, they are not interested in themselves.

Demography or population studies is at one and the same time a discipline, an "interdiscipline," and a subdiscipline. It is clearly a discipline because it is a field with its own body of interrelated concepts, techniques, journals, departments, and professional associations. Demography is

also an interdisciplinary field because it draws its subject matter and methods from many disciplines including sociology, economics, biology, geography, history, and the health sciences. Finally, demography also is considered a subdiscipline within some of these same major disciplines. In most universities, demography programs are housed within the sociology department, perhaps because population phenomena have so long been linked to social causes and consequences.[2]

Demography is defined as the study of human populations: their size, composition, and distribution, as well as the causes and consequences of changes in these factors. Populations are never static, they grow or decline through the interplay of three demographic processes: births, deaths, and migration. If some groups within a population grow or decline faster than others, the composition of the whole is altered.

This *Bulletin* presents the basic what, why, and how of the study of demography. It is not a comprehensive treatment of the subject, but provides an overview of demographic processes and the basic measures used to assess them. In addition, it traces population trends in the world and the United States, surveys the demographic differences among population groups, and examines broad social issues linked to population change.

The first three sections of the monograph provide the framework for studying the dynamics of population. Fertility, mortality, and migration are at the root of all demographic change. The fourth section of the *Bulletin* reveals how changes in fertility, mortality, and migration affect a population's size and growth rate, and how population projections are calculated. The fifth section delves into the composition of populations according to common variables: age, sex, and race or ethnicity. The sixth section describes how the geographic distribution of populations change, primarily through migration. The final sections discuss issues and problems associated with population growth.

Fertility

The study of population dynamics must begin with fertility. Fertility refers to the number of births that occur to an individual or in a population. In 1990, fertility rates of national populations ranged from an average of 1.3 children per woman in Italy to 8.1 children per woman in Rwanda. The average for the United States was 2.1 and for the world, 3.6. On an aggregate basis, over 4 million babies were born in the United States in 1990, and about 24 million in China. Worldwide, 143 million new human beings were born in 1990, about 272 per minute.

Fertility must be distinguished from its sister term, **fecundity,** which refers to the physiological ability of individuals or couples to have children. Some individuals are infecund–unable to bear children because of disease or genetic dysfunction. Others are superfecund. The world record for high fecundity is held by a 19th century Russian woman who reputedly produced 69 children in 27 pregnancies.[3] This claim is suspect, but there is documented evidence of women giving birth to 30 children. Thus, for individuals, fecundity may range from zero to about 30 children.

The maximum fecundity of a population, which is composed of individuals with varying levels of fecundity, is thought to be about 15 children per woman.[4] This is the theoretical maximum number of children a population of women could produce if they engaged in regular sexual intercourse from menarche, at around age 12, until they reached menopause, at around age 50, and never used any form of birth control.[5]

The theoretical maximum of 15 children is a far cry from real life levels. Even in the world's highest fertility countries the average rarely exceeds eight children per woman.

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What accounts for this large gap? In every society a variety of cultural, economic, and health factors interfere with the process of human reproduction. These factors include cultural values regarding childbearing (does the society value large or small families?); social roles (is the wife primarily a childbearer and childrearer?); economic realities (do parents rely on children to look after them in old age?); and the prevalence of diseases, like gonorrhea, that impair fecundity.

Most of these factors do not affect fertility directly; they influence another set of variables that determine the rate and level of childbearing. In 1956, demographers Kingsley Davis and Judith Blake isolated the factors that control the probability that a woman of reproductive age (roughly ages 15 to 49) will become pregnant and produce a child. The classic list of factors identified by Davis and Blake were labeled the "intermediate variables" that determine a society's fertility level. A modified list of these variables is given in Box 1, arranged according to whether they affect (1) fecundity, (2) marriage, or (3) birth control. These factors operate in every society, but the relative importance of each varies tremendously.

In 1982, demographer John Bongaarts published a landmark article demonstrating that four of these variables explain nearly all the variation in fertility levels among populations. These four "proximate determinants of fertility," as he termed them, could be quantified and expressed as a simple formula, creating a versatile method for statistical analysis. The four proximate determinants are (1) the proportion married, (2) the percent of women using contraception, (3) the proportion of women who are infecund (primarily due to breastfeeding), and (4) the level of abortion. West Germany, for example, achieved the lowest fertility rate on record for a nation—1.28 births per woman in 1985—in large part because of relatively high rates of contraception and a low rate of marriage among women in their prime childbearing years. Conversely, the Hutterites, a North American religious sect, averaged 12 children per woman in the 1930s—the highest fertility on record for any population—by promoting early and universal marriage and eschewing contraception and abortion.[6]

Box 1

The Intermediate Variables that Affect Fertility

1. Fecundity
   - ability to have intercourse
   - ability to conceive
   - ability to carry a pregnancy to term

2. Sexual Unions*
   the formation and dissolution of unions
   - age at first intercourse
   - proportion of women who are in a union
   - time spent outside a union (for example, separated, divorced or widowed)

   intercourse within sexual unions
   - frequency of sexual intercourse
   - sexual abstinence (for example, for religious reasons)
   - temporary separations (for example, for military service)

3. Birth Control
   - use of contraceptives
   - contraceptive sterilization
   - induced abortion

*Ranging from casual relationships to legal marriage

References

Kingsley Davis and Judith Blake "Social Structure and Fertility: An Analytic Framework," *Economic Development and Cultural Change* vol. 4, no. 3 (April 1956); and Joseph A. McFalls, Jr. and Marguerite McFalls, *Disease and Fertility* (New York: Academic Press, 1984).

WORLD BANK

While Bongaart's variables construct a valuable framework for analyzing fertility differences, they gloss over the cultural and biological mechanisms that affect fertility in all societies. In many African countries today, women marry young and rarely use contraceptives, yet fertility is kept to a six or seven-child average through cultural factors. Cultural practices such as prolonged sexual abstinence after childbirth (often up to two years) and the breastfeeding of babies until age two or three, prolongs the infecund period following childbirth. African husbands often work away from home for months at a time which further reduces the time wives are exposed to the risk of pregnancy. In certain West and Central African countries, a high prevalence of sexually transmitted disease has caused infecundity in one-seventh to one-third of the women of childbearing age.[7]

Measuring Fertility

The fertility rates discussed above, except for the 12-child Hutterite average, are **total fertility rates (TFRs).** The TFR is a commonly used rate because it is easy to visualize what it stands for–the average number of children in a family. But the TFR is a synthetic rate; it does not measure the fertility of any real group of women. It measures the fertility of an imaginary group of women who pass through their fictitious reproductive lives subject to the rates of childbearing experienced by real women in a given year. Although the TFR concept is not intuitively obvious, it is actually straight-forward and it is easy to calculate from age-specific birth rates (see Box 2).

Another attraction of the TFR is that is allows us to explore the concept of replacement level fertility.

Box 2

Demographic Measures

Demographers use a variety of rates and other statistics to describe populations. In addition, they differentiate **crude** from **refined** and **adjusted** rates. What do these measures really mean?

A **rate** shows the frequency of a demographic event in a population during a specific time period. For example, the United States recorded 8.6 deaths per 1,000 persons in 1990. The U.S. death rate is calculated from the number of deaths during 1990 and the total U.S. population for that year.

But this is the crude death rate. Its value is affected by the composition of the population--in particular the age structure. Because age composition varies over time and among populations, it is difficult to use the crude rate to track changes in mortality or to compare U.S. mortality with that of other countries.

One way to minimize the effects of age structure on crude rates is to calculate separate rates for each age group. In the case of fertility rates, age-specific birth rates usually are calculated for each five-year age group of women between the ages of 15 and 49 (or sometimes age 44). To obtain the age-specific birth rate for women age 20 to 24, for example, the number of births that occurred to women age 20 to 24 in a given year is divided by the total number of women in that age group (see table).

Age-specific rates may be calculated for deaths, migration, marriage, college attendance, migration, or any other variable. Similarly rates may be calculated separately for women with specific characteristics, such as birth rates for married women only. Death rates may be calculated separately for each cause of death as shown in Table 1, page 11. Such cause-specific rates can indicate which diseases claim the most lives.

Age-specific rates often are used to calculate summary measures, such as the TFR, or to adjust a crude rate so that the age differences are minimized. The U.S. National Center for Health Statistics and many other national statistical agencies regularly publish death rates adjusted for age to facilitate comparisons among population groups and over time.

Users of demographic data need to recognize the difference between crude and refined or adjusted rates and to learn when it is appropriate to use a given measure.

Calculating the U.S. Total Fertility Rate (TFR), 1988

Age of Women	(1) Number of Women	(2) Births to Women in Age group	(3) Age-specific Birth rate (2) ÷ (1)
15-19	8,890,000	488,941	.055
20-24	9,574,000	1,067,472	.111
25-29	10,928,000	1,239,256	.113
30-34	10,903,000	803,547	.074
35-39	9,660,000	269,518	.028
40-44	8,155,900	40,776	.005
		Sum	.386
		TFR=Sum × 5	1.93

Source: Arthur Haupt and Thomas Kane, *Population Handbook*, 3rd. Edition. (Washington, DC: Population Reference Bureau, 1991)

This is the level of childbearing at which couples have an average of two children (a TFR of 2.0)—thus just replacing themselves in the population. A population with replacement level fertility eventually will stop growing (this is discussed more fully in the section on population growth). Actually, replacement level fertility requires a TFR slightly above 2.0, usually about 2.1 to 2.2, primarily because some children will die before they grow up to have their own two children.

The **crude birth rate** is the most easily obtained and most often reported fertility measure. It is calculated from the number of babies born in a given year (or any other time period) divided by the mid-year population, and is expressed as the number of births per 1,000 population. In 1990, the U.S. birth rate was 17 births per 1,000. For the world, the rate was about 27 per 1,000.

As the name implies, this rate is considered a crude measure of a society's childbearing patterns. This is because fertility is so heavily affected by the sex and particularly by the age composition of a population. Younger women have higher birth rates than older women, thus a female population consisting primarily of young women will produce more births than a population made up of older women. More refined rates attempt to minimize the effects of age structure. In addition to the TFR, these include the **general fertility rate,** which measures the number of births per woman of childbearing age (ages 15 to 49), and the **net reproduction rate,** which measures the number of daughters born per woman who are likely to live to adulthood.[8] These rates allow demographers to compare more accurately the fertility of different countries. Of these rates, only the TFR and crude birth rate are used in this *Bulletin*.

Lifetime fertility: cohort rates

What if we want to measure the fertility of a certain group of women, for example, women born between 1940 and 1945? For women who are past their reproductive years, say above age 50, a **completed fertility rate** can be estimated by determining the average number of children they bore from the time they experienced menarche in their early teens until menopause. Completed fertility is a useful measure for comparing the fertility levels of different generations. In the United States, women born between 1906 and 1910 (the 1906-1910 birth cohort) produced what was then the smallest number of children in U.S. history, an average of 2.2 children per woman. The 1931-1935 cohort, who became parents during the baby boom, produced the largest number–a completed fertility rate of 3.2 children per woman. Baby boomers—Americans born between 1946 and 1964—may well average fewer children than the 1906-1910 cohort, but because they have yet to complete their childbearing years, we cannot measure their completed fertility.

Completed fertility is a cohort measure because it describes the fertility of a specific cohort of women. The TFR and crude birth rate are **period** rates because they measure fertility for a given period of time. Cohort rates tell us nothing about current fertility. Likewise, period rates, like the TFR for 1988, cannot predict future fertility. We do not know what the completed fertility of women who were age 20 to 24 in 1988 will be by the time they reach menopause around 2020. The difference between cohort and period rates explain how it is possible that, during the height of the U.S. baby boom (1957) the TFR reached 3.7 children per woman, yet no cohort of women born in the 20th century has recorded a completed fertility rate above 3.2 children.

The TFR and crude birth rate are period rates because they [illegible]e fertility [illegible]ven per[illegible]d of time.

Fertility in the United States

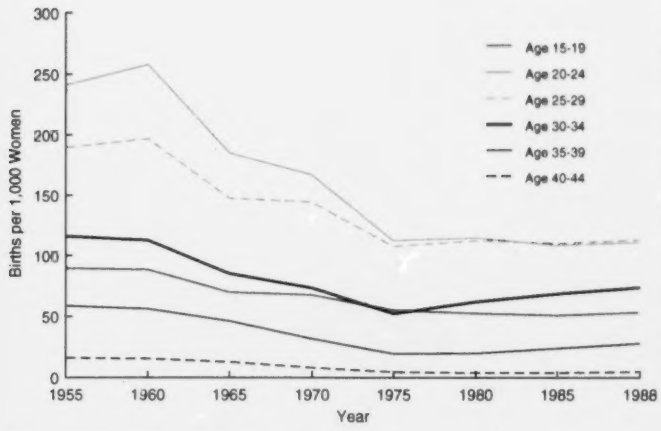
American women averaged more than seven children each until the early decades of the 19th century. Average fertility declined gradually thereafter, interrupted only by the baby boom following World War II. The TFR reached an all time low of 1.74 children in 1976, and it has remained relatively low ever since. By 1990, the TFR had edged up to a 2.1-child average. The baby bust came about in large part because of a postponement of marriage and because of the widespread use of contraception and abortion. Judging by the long-term fertility trend and the current social trends favoring low fertility, birth rates are likely to remain low.[9]

Despite the fact that few American women believe childless or one-child families are ideal, many women have delayed marriage and childbearing so long that they will have only one child or no children at all.[10] Some 16 percent of American women who were ages 40 to 44 in 1990 had never had children, and most of these women never will.

Fertility Differentials

Although the overall fertility rate in the United States has remained fairly stable since the 1970s, there is considerable variation among individual couples. Among all women of reproductive age (roughly ages 15 to 44), only 23 percent conform to the two-child average. Forty-two percent have not yet had any children, and 2 percent have had five or more children. What accounts for these differences? The most predictable and obvious explanation of fertility differentials is age, but income, race, religion, and many other social, economic, and cultural factors influence childbearing.

Figure 1
U.S. Birth Rates by Age of Mother, 1955-1988



Source: National Center for Health Statistics.

Age

Women are able to conceive a pregnancy beginning in their early teens and ending in their late 40s. Over this roughly 30-year span, birth rates vary substantially by age (see Figure 1). Since 1983, U.S. women ages 25 to 29 have had the highest birth rates, slightly higher than women ages 20 to 24, the previous leaders. Another age-related phenomenon can be discerned in Figure 1. Childbearing among women age 30 to 44 reversed its steep decline and turned up during the late 1970s and 1980s. Many of these older mothers began to have the children they had postposted earlier in life. Finally, Figure 1 reveals that the rate of teenage childbearing has remained relatively low over the last two decades, despite the fact that teens have become sexually active at younger ages.[11]

The birth rates by the age of mother follow the same general pattern in most societies—rates are low in the teens, peak in the twenties, and decline thereafter. But comparisons of the age-specific rates in different countries reveal significant variations, as shown in Figure 2. In Japan, where the 1988 TFR was 1.7, there is a remarkable concentration of childbearing among women 25 to 29 years of age. These women produce nearly one-half of all Japanese births. In the United States, birth rates also are highest for women 25 to 29 years of age, but they account for just under 30 percent of all births. In the West African country of Ghana, where the TFR was an estimated 6.4 in 1988, birth rates rise very gradually from the teens to a peak in the late-20s and then decline slowly into the 40s. At every age, Ghanaian women have higher birth rates than American and Japanese women.

Race and Ethnicity

In many countries, racial and ethnic minorities have higher fertility than majority groups. Often these differences arise from religious beliefs and cultural traditions, but, they also are linked to the lower economic status of

minority groups and the number of years they have lived in their adopted country. As immigrant groups assimilate socially and economically, they tend to adopt the fertility patterns of the majority. In the United States, for example, fertility differences among white ethnic groups (Irish, German, or Italian Americans, for example) are becoming less distinguishable over time.[12]

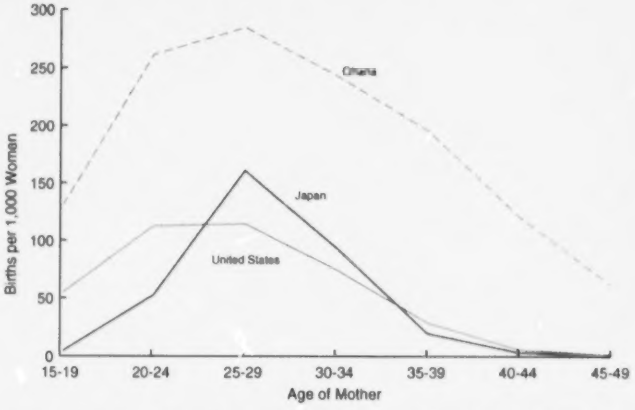
Groups that have not fully "assimilated" may maintain their distinctive fertility patterns. In the United States, Hispanics, African Americans, and American Indians have higher fertility than the white, non-Hispanic majority.

In 1988, the TFR was 1.8 for white women and 2.4 for black women. The TFR for Hispanic women was about 2.6 in the 1980s. Asian Americans tend to have rates close to non-Hispanic whites.[13]

Arabs in Israel, Asians in the Soviet Union, and Turks in Germany are other examples of ethnic groups whose fertility has remained higher than the national average.

Figure 2

Age Patterns of Fertility: United States, Japan, and Ghana, 1988



Source: National Center for Health Statistics (U.S.); Institute of Population Problems (Japan), and the Ghana Demographic and Health Survey.

Socioeconomic Status

In nearly every contemporary society, the poor have more children than the rich. This is also true for the United States within all major racial and ethnic groups. In general, fertility goes down as the income and educational attainment of women increase. In 1988, for example, women 35 to 44 years old with five or more years of college averaged 1.6 births compared with 2.3 births for women who completed high school only, and nearly three births for non-high school graduates.[14]

Other Differentials

Numerous other social, religious, and cultural factors are associated with fertility differences. Most of these can be explained by the age, income, or education differences among these groups.

In just about every culture, women who work outside the home have fewer children than those who do not, and rural women have more children than urbanites. People who actively practice a religion tend to have higher fertility than non-religious people. There are long-standing differences between major religious groups in many countries, but these often are intertwined with ethnic and socioeconomic differences.[15]

Mortality

Mortality, the counterpoint to fertility, is the second cause of population change.

Mortality, the counterpoint to fertility, is the second cause of population change. The death rate for a population is usually expressed as the number of deaths per 1,000 persons in a given year. In 1990, 2.2 million Americans died, producing a U.S. death rate of 9 deaths per 1,000 persons. Throughout the world, 50 million people died that same year, also 9 deaths per 1,000. Worldwide, death rates range from only 3 or 4 in Costa Rica and Jordan, for example, to the low 20s in Ethiopia, Mali, and a few other African countries.

The death rate measures the proportion of a population that dies each year, but comparing death rates among populations does not show

whether one population is healthier or more long-lived than another. This is because the death rate is strongly influenced by the age structure of the population. Death rates often are higher in developed countries such as Denmark than in third world countries such as Mexico, even though developed countries tend to have healthier environments and better medical services. A large proportion of the population of developed countries is in the older ages—the ages at which most deaths occur—while a relatively small proportion of the population of developing countries is in the older ages. Nearly 40 percent of the population of Mexico is under age 15, when fewer deaths occur, and only 4 percent is age 65 or older. In contrast, only 17 percent of Danes are under age 15, and 16 percent are age 65 or older.

Life expectancy reflects the real life conditions in a population while life span is a theoretical maximum based on the premise that humans have a genetic clock that eventually orders the body to shut down after a certain age.

Life Expectancy

To better gauge the life chances of individuals in a population as well as to better compare mortality conditions among countries, we must look at the average **life expectancy.** Both biological and social factors influence how long individuals live, and by extension, the average life expectancy within a population. In 1990, the average life expectancy at birth in the United States was 75 years. The world's highest life expectancy was in Japan, at 79 years. The lowest life expectancy estimates were for the West African countries of Sierra Leone, Guinea, and Guinea-Bissau, at about 42 years.

Life expectancy is a concept many people use but few understand. What does the 1990 U.S. life expectancy of 75 years really mean, and to whom does it apply? The term life expectancy usually is used as a short-hand way of expressing "life expectancy at birth." Can we conclude that a child born in the United States in 1990 can be expected to live to an average age of 75? Not really. As an infant born that year proceeds through life, mortality conditions will change. There may be nuclear wars, devastating plagues, or fantastic medical advances.

Life expectancy at birth in 1990 applies to no real group, not even to real people born in 1990. Like the total fertility rate, life expectancy applies to a hypothetical group who pass through their imaginary lives subject to the death rates at each age for 1990. Age-specific death rates refer to the number of deaths of persons within a specific age group divided by the total number of people in that age group. This can also be expressed as the probability of dying at a given age. These probabilities are used to construct a life table, or actuarial table, which is used to calculate life expectancy at birth or at any other age. The U.S. life table for 1990, for example, shows that Americans in the 80 to 84 age bracket have eight additional years of life remaining, on average. Having survived the major causes of death at younger ages, these senior citizens already have demonstrated that they will live longer than the average.

Life Span

How high can life expectancy get? The upper limit is governed by the maximum **life span** for the human species. Although the two terms are often confused, life expectancy reflects the real life conditions in a population while life span is a theoretical maximum based on the premise that humans have a genetic clock that eventually orders the body to shut down after a certain age.[16] Many individuals outlive the average life expectancy for their society (13 million Americans were over age 75 in 1990), but no one can live longer than the human life span. Maximum life span, like maximum fecundity, is rarely achieved. There have been reports of Americans living as long as 137 years, and of large groups of people in the mountains of Ecuador, the Soviet Caucasuses, and Kashmir living well past 100, some even to age 150. But the very old often exagger-

ate their age, and the recording of birth dates and ages can be haphazard in developing countries, especially when these centenarians were born. The oldest person in the world whose age has been authenticated was just over 120 years. But experts disagree about the upper limit of human life span and about whether it is possible to push it to higher levels through medical technology or bioengineering.[17]

Only about 1 in every 100 Americans born in 1980 can expect to live beyond the age of 100 given current death rates.[18] In fact, the average life expectancy for a national population may never exceed 85 years, barring some medical breakthrough.[19]

Although many world regions still have extremely high mortality from easily curable diseases, human beings live much longer now than in the past. The average life expectancy in the world at the turn of this century was less than 30 years of age; by 1991, it was 68 years. Thus, since the origin of the human species some 2 to 5 million years ago the vast majority of progress in conquering premature mortality has taken place in the minute slice of time since 1900. Much of the increased life expectancy worldwide reflects the accumulation of knowledge about how diseases spread and consequent changes in personal hygiene and public health practices.[20]

A large share of the remaining gap in mortality between developed and developing countries can be attributed to preventable diseases that strike children particularly hard. Four causes of death—diarrhea, respiratory infections, measles, and neonatal tetanus—account for almost two-thirds of the 14 million deaths of children under age five each year.[21] Antibiotics, immunization, and clean drinking water have drastically reduced the incidence and severity of these diseases in the United States and other low-mortality countries. If adequate health services were available throughout the Third World, childhood mortality could fall quite rapidly.

Mortality in the United States

Life expectancy in the United States was age 75 in 1990, a spectacular improvement over an average life expectancy of only age 47 in 1900, but still 10 years short of the theoretical maximum of 85.

How could mortality be reduced further in the United States? We need first to look at the causes of death. Table 1 lists the 15 leading causes of death in the United States that account for about 90 percent of all deaths. Heart disease and cancer are the two biggest killers. Indeed these two diseases are in a league by themselves. They and most of the other major causes of death strike primarily after age 50 rather than during childhood. But no one is immortal. All the progress in life expectancy has, after all, only postponed death.

Table 1

The 15 Major Causes of Death: United States, 1988

Rank	Cause of death	Deaths per 100,000	Percent of all deaths	Ratio of Rates Male: Female	Ratio of Rates Black: White
1	Heart disease	311	35	1.9	1.4
2	Cancer	197	22	1.5	1.3
3	Stroke	61	7	1.2	1.9
4	Accidents	40	5	2.7	1.3
5	Lung diseases	34	4	2.0	0.8
6	Pneumonia and influenza	32	4	1.7	1.4
7	Diabetes	16	2	1.1	2.4
8	Suicide	12	1	4.0	0.6
9	Liver disease	11	1	2.3	1.7
10	Kidney disease	9	1	1.5	2.8
11	Atherosclerosis	9	1	1.3	1.1
12	Homicide/Legal intervention	9	1	3.3	6.4
13	Septicemia	9	1	1.3	2.6
14	Conditions of the perinatal period	7	1	1.3	2.7
15	Human Immunodeficiency Virus (HIV)	7	1	8.6	3.4

Source: National Center for Health Statistics, *Monthly Vital Statistics Report* 39, no. 7, Supplement (November 1990).

Mortality Differentials

The Grim Reaper does not bring death to everyone on an equal basis. Death rates vary by everyday social categories such as age, sex, socioeconomic status, race, ethnicity, and religion. The reasons for these differentials in mortality have been examined in other publications.[22] In this *Bulletin* the emphasis is on the more demographic concerns of sheer dimension and the immediate cause of mortality.

Age

When death rates by age for the United States are plotted on a graph, they form the characteristic J- shaped curve of mortality, a pattern found in all societies, but which is most pronounced for countries with higher mortality rates (see Figure 3). The death rate is relatively high during the first year of life, declines throughout childhood and early adolescence, and then begins an inexorable climb to the towering peak of old age. From the point of view of the mythical Grim Reaper, Americans are most elusive at ages 10 and 11 when only 1 out of every 5,000 people dies, and most vulnerable at age 114 when virtually everyone is harvested.

Most young adults are relatively safe. Young Americans have barely a 1 percent chance of dying between ages 15 and 24. But that 1percent attrition means that 40,000 individuals in each successive group of 15-year olds never reach their 25th birthday. Most of these deaths are socially preventable. Indeed, the rank order of causes of death for 15 to 24-year-olds is very different from that shown in Table 1 for the entire population. Accidents, homicide, and suicide ranked one-two-three, and accounted for a disturbing 78 percent of all deaths to 15 to 24-year olds in 1988. Over the last three decades, the death rate for Americans as a whole has been cut in half, but that of young adults has remained about the same. Why? A dramatic rise in violent deaths among young adults has offset reductions in other causes.

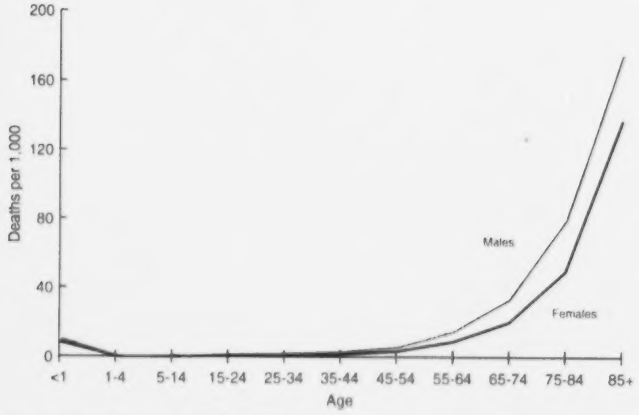
Death in the first year of life, infant mortality, is an important demographic variable, and often is used as a key measure of a society's quality of life. Infant mortality in the United States has declined tremendously during the 20th century. Around 1915, 96 newborns died out of every 1,000 births. By 1990, the rate was 9 infant deaths per 1,000 births, low by world standards but still higher than most European countries.[23] In many developing countries—where health care systems are inadequate and serious infectious diseases are rampant—1 of every 10 newborn babies dies before its first birthday.

Sex

Women have lower death rates than men at every age (see Figure 3). Even before birth, fewer female than male fetuses die in the womb. The net result of this female advantage is that women live longer than men. In 1990, female life expectancy in the United States was 79 years, seven years more than that of men. About three-quarters of American centenarians are women.

The sex difference in mortality is greatest for young adults. For

Figure 3
U.S. Death Rates by Age, 1990



Source: National Center for Health Statistics

example, the death rate for 15 to 24-year-old males is nearly three times greater than that of their female counterparts. Notice first that all the leading causes of death in Table 1 kill males at a higher rate than females. Which causes have the highest male to female ratio? They are human immunodeficiency virus infection (AIDS), which until recently mainly struck young men; suicide, which claims four times as many male as female lives; homicide, a killer especially of young black men; and accidents, which tend to befall young men because of their risk-taking behavior. In short, the sex differential in mortality is greatest during ages 15 to 24 because the major causes of death in those ages are also the ones with the highest male to female ratio.

Socioeconomic status

Higher status individuals live healthier and longer lives than their lower status counterparts in virtually every society. The United States is no exception. All the major indexes of social status in the United States–occupation, income, and education–show a negative relationship between status and mortality.[24] In the United States, the National Longitudinal Mortality Study documented such differences in individuals who died in the early 1980s.[25] The study found that, among white men ages 25 to 64:

- Persons with low family incomes (less than $5,000 per year in 1979-81) had death rates 3.5 times higher than those with high incomes ($50,000 or more per year).
- Persons with only five to seven years of education died at 2.6 times the rate of those with four or more years of college.
- Laborers had nearly twice the death rates of professionals.

Race and Ethnicity

Racial and ethnic minorities often suffer greater premature mortality than others, usually because they are also economically disadvantaged. African Americans have always died at younger ages than whites in the United States. The gap in life expectancy between the two races was more than 15 years around 1900, and was still 6 years (76 for whites versus 70 for blacks) in 1990. Black female life expectancy was five years lower than that of white females. Similarly, black male life expectancy was seven years below that of white males (and more than 13 years less than that of white females), placing black males at the bottom of the mortality totem pole. Indeed, black males born in places such as Harlem have only a 40 percent chance of living to age 65, a rate lower than that of males in Bangladesh, one of the world's poorest countries.[26]

The biggest difference in death rates occurs between ages 25 and 44, when blacks die at more than twice the rate that whites do. In general, blacks die younger than whites because they are more vulnerable to 13 of the 15 leading causes of death shown in Table 1. Note especially the 6 to 1 black-to-white ratio in homicide. Homicide is the chief cause of death for black youths.

American Indians live about four years less than whites. Hispanics, however, have mortality rates close to U.S. national averages, despite their lower socioeconomic status. Non-immigrant Asian Americans have a substantially longer life expectancy than white Americans, and the life expectancy of recent Asian immigrants is rapidly approaching that of the general population.[27]

Higher status individuals live healthier and longer lives than their lower status counterparts in virtually every society.

Migration

The third component of population change is migration, the movement of people into or out of a specific geographic area. Migration can add to or subtract from an area's population, depending upon whether more people move in or out. Migration usually has the greatest impact on population change in small geographic areas or where natural increase is extremely low or negative.

Migration is the most complex and volatile demographic variable.[28] It can

occur in great waves in response to world events—such as the mass exodus from East to West Germany in 1990—or as a slow trickle. Migration is selective. Some people are much more likely to move than others. Also, migration is closely tied to the life cycle. People are most likely to move at certain stages of their lives: especially when they marry, divorce, and retire.

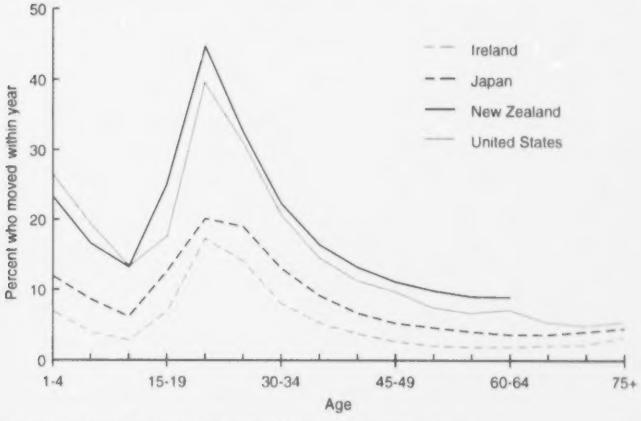
Migration is also more difficult to measure than fertility and mortality. Every year, millions of Americans move to a new home, but not all such residential mobility is classified as migration. Neither are temporary moves for work or leisure. Migration is the movement of people across a territorial boundary for the purpose of changing residence.

International migration involves movement across a national border, while internal migration describes moves within a country. The terms **in-migration** and **out-migration** refer to movement into or away from an area within the same country. The terms **immigration** and **emigration** refer to people moving into or out of a country. **Net migration**, the difference between the in's and out's, may be positive or negative. In the 1980s, the state of Florida had a net gain of 2.5 million people through migration, while Michigan had a net loss of 550,000.[29] The United States as a whole experienced a net immigration of at least 6.2 million residents during the 1980s.

In the developing world, where internal migration is dominated by moves from the countryside to the cities, rural areas often experience net out-migration while urban areas have high rates of net in-migration.

Figure 4

Residential Movers by Age: United States and Selected Countries Around 1980



Source: Larry Long, *Population Studies*, Vol. 46 (forthcoming article, 1992).

Types of moves

The U.S. population is extremely mobile by world standards. In recent years, for example, about four times as many Americans changed residence as residents of Ireland. The residential mobility rate is the proportion of a population that moved during the past year. In the United States, the rate has varied between 16 percent and 21 percent since 1960. Almost two-thirds of this movement involved moves within the same county. Intra-county movers generally are making housing adjustments or responding to life cycle changes such as leaving the parental home, marriage, or divorce. Longer distance moves are primarily for economic reasons such as seeking a new job or accepting a corporate transfer. Others move long distances to attend school, to change climate or lifestyle, or for family reasons. Residential mobility can foment social problems when there is too much of it, or when it adversely affects the places of origin or destination.[30]

Who migrates?

Age

In most countries, residential mobility is relatively high for children under age 5; relatively low during the mid-teens; and extraordinarily high for persons in their early 20s. Thereafter mobility rates decline, rapidly at first, and then more gradually with age (see Figure 4). Young adults, especially those of college age are the prime movers (if not yet shakers) in most societies.

The similarity of the curves for the countries in Figure 4 reveals the link between life cycle events and residential mobility. Mobility is high between the late teens and the early 30s as individuals leave their parent's homes to attend college, find jobs, get married, and build families. Naturally, the young children of these people also have high rates of mobility. As older parents buy homes and settle into neighborhoods and careers, their mobility and that of their children (who by this time are in their teens) declines. The elderly tend to stay put, although a sizable minority become transplanted retirees while others move out of their family homes into smaller residences or life-care facilities.

Sex

In the United States, women are about as likely as men to migrate, but the rapid increase in mobility in the late teens starts earlier for women than for men, owing to the fact that women tend to marry at a younger age than men.

In many Latin American countries, the important stream of rural-to-urban migrants is dominated by young women because they are more likely to find a job in urban areas, often as domestic workers. In African countries, however, the men are much more likely to move to the city to find work.

Race and Ethnicity

In the United States, members of minority groups move more often than whites, but they tend to move shorter distances. In 1986, for instance, the proportion of whites who moved was 18 percent compared to 20 percent for blacks and 23 percent for Hispanics.[31] Residential moves among blacks are less concentrated in the young adult ages. These racial differences are attributable to the fact that blacks are more likely to be poor and less likely to own their residence.

Socioeconomic Status

There is no simple link between residential mobility and occupation or

Box 3

How Often Do People Move?

Most national data on residential mobility come from questions asked by the U.S. Census ("Where did you live on this date five years ago?") or by the Census Bureau's Current Population Survey ("Where did you live on this date one year ago"?). These data were used to calculate the age-specific rates for the United States in Figure 4. But how can we answer such questions as: how many times does the average person move?; or how often does the average person move?

As with fertility and mortality, it is not possible to answer these questions for real people. But it is possible to answer them for imaginary people using the life table approach. This is done by estimating the number of moves a hypothetical cohort will make in its lifetime if it is subject to the age-specific mobility rates (and mortality rates) of a given year. When demographer Larry Long used this life table approach on 1982 data for the United States, he found that a hypothetical cohort of 100,000 individuals would move to a new residence 10.5 times over their lifetimes.[1] This is the source of the oft-quoted statement that the average American moves about 11 times over a lifetime.

The other oft-quoted statistic, the average number of years between moves, can be calculated by dividing life expectancy (which was 74 years in 1982) by the number of lifetime moves (10.5). The answer, 7.0, suggests that the average American moves once every seven years. But there are enormous individual differences in the propensity to move. Some individuals move nearly every year, thereby inflating the mean; others hardly ever move.

Reference

1. Larry Long, *Migration and Residential Mobility in the U.S.* (New York: Russell Sage Foundation, 1988).

income. Doctors, lawyers, and others who rely on local bases of operation have low rates of mobility, for example, while business executives often are highly mobile.

Only educational attainment is clearly related to mobility, and that relationship is U-shaped. The most frequent movers are individuals at the educational extremes, the high school dropouts and the college educated. Those in the middle, who complete high school but do not go on to college, have the lowest mobility rate.

The distance of moves does differ by education. The best-educated make relatively more long distance moves; the least-educated make relatively more local moves.

International Migration

International migration is a worldwide phenomenon. At the beginning of the 1990s, international migration streams of one sort or another were making headlines around the world—the dramatic stampede of East Germans into West Germany; white South Africans "taking the chicken run," as South Africans derisively call it, out of that nation; Turks leaving Bulgaria to avoid forced assimilation; the influx of Asians into Australia; and the emigration of Soviet Jews to Israel.[32]

These migrations occurred for the traditional reasons—the migrants either wanted to upgrade their lot in life or escape from difficult, often intolerable, circumstances. In short, migrants are "pushed" from their homeland by difficult conditions and/or "pulled" to a new country where conditions appear better.

The United States is traditionally a country of immigrants, and presently receives twice as many immigrants as all other countries combined. Many experts estimate that nearly 1 million newcomers have immigrated to the United States annually over the past few years—the highest level since the mass immigration of Europeans in the decades before and after 1900.

During the 1980s legal immigration averaged about 700,000 persons a year. Illegal immigration probably

averaged between 200,000 and 400,000 persons per year although some estimates run even higher.[33] The numbers seeking to enter the United States are not likely to abate in the near future because of continuing population and economic pressures in the Third World, particularly in Mexico and the Caribbean basin.

Around 150,000 U.S. residents emigrate each year. Most are older immigrants who are returning to their country of origin to spend their last years; others are simply looking for a country with a lower cost of living. Indeed, Mexico now has more U.S. Social Security beneficiaries than any other foreign country.[34]

International Migration Differentials

Age

Young adults and their children are more likely than older individuals to immigrate to a new country. The immigrant flows to the United States traditionally have been dominated by young adults. Although U.S. immigration policy with its guiding principle of family reunification (giving preference to relatives of previous immigrants) has diminished the proportion of young adults among recent immigrants, young adults are still the predominate legal, and particularly illegal, immigrants to the United States.

Sex

Males have traditionally outnumbered females among immigrants. An extreme example of this phenomenon was the 27-to-1 male-to-female ratio among Chinese immigrants to the United States in the early 1900s. Today the ratio is nearly one-to-one (1.02 males for every female), at least for legal immigrants. The male-to-female ratio is substantially higher, however, for refugees, asylum-seekers, and illegal aliens.[35]

Race and Ethnicity

The vast majority of immigrants to the United States between the early 1800s and the mid-1960s were Europeans. But for most of the 1980s, Europeans accounted for only about 10 percent of immigrants. About 43 percent of legal immigrants came from Asia and another 43 percent from Latin America. Africa contributed only 3 percent. The vast majority (80 percent) of all illegal immigrants come to the United States from Latin America.[36]

Socioeconomic Status

Often the more ambitious and adventuresome people in a poor society are the ones who migrate. Migrants tend to be more educated than others in their home community, but less educated than the residents of the country to which they are moving. However, immigration laws can alter the type of person allowed in, for example, by restricting unskilled workers and encouraging highly educated professionals.

Often the more ambitious and adventuresome people in a poor society are the ones who migrate.

Legal immigrants as a whole have higher socioeconomic status than natives in their country of origin, but somewhat lower status than U.S. residents. But the differences vary greatly among individuals and immigrant groups. With respect to education, for example, 1980 Census data show that 67 percent of the total U.S. population aged 25 and over had at least completed high school compared to only 52 percent of immigrants. But the proportion completing high school was much greater for immigrants from Africa (82 percent) and from Asia (73 percent), especially from India (89 percent); and lower for immigrants from Latin America (41 percent), particularly those from Mexico (21 percent).[37]

Statistics on occupation and income tell a similar story. Among the largest immigrant groups, Asians have a relatively high socioeconomic status and Hispanics a relatively low one. However, during the 1980s, a heavy influx of less-educated Southeast Asians has brought more economic diversity to the Asian immigrant population. While the incomes of Asians remain higher than for other groups, there is also growing

poverty among those Asians at the bottom of the socioeconomic ladder.[38]

The "Brain Drain"

When educated and highly skilled people emigrate to a new country, their home country loses. Not only does the home country lose its investment in raising and educating those ex-patriots, it also loses their potential social and economic contributions. This "brain drain" is not just a problem for developing countries such as India. Many top scientists, engineers, and college professors from Great Britain and other developed countries now work in the United States.

Migration and Social Networks

Migration is a social process involving social networks that connect the place of origin to the place of destination .

Individuals usually do not choose to uproot themselves and their families at random to move to another area; nor do they choose their place of destination by flipping a coin. Migration is a social process involving social networks that connect the place of origin to the place of destination. The movement of individuals takes place through chain migration, defined as movement in which prospective migrants learn about job opportunities, transportation, and housing in the place they want to move to from relatives or friends from their home area who have migrated ahead of them.[39]

Chain migration operates in both international and internal migration. In the former, a few bold immigrants blaze a trail to a new country, establish a foothold, and then send for friends and family to join them. These individuals form small ethnic communities, such as the Chinatowns in cities throughout the world, which act as magnets (or "pull" factors) to others in the place of origin. Most immigration to the United States has followed this pattern. It is still operating today. Hispanic and Asian immigrants often join established colonies of their compatriots such as Little Saigon in Orange County, California. Moreover, U.S. immigration policy encourages chain migration by granting entrance visas to selected foreign relatives of current U.S. residents.

Chain migration also played an important historical role in rural to urban migration. The presence of a network of relatives and friends in a particular city attracts rural outmigrants to that city and helps ease the problems associated with relocation. While chain migration is not as important in the United States today as it was in the past, moving "to be closer to families and friends" is still one of the main reasons given by individuals for internal migration.[40]

But when it comes to social networks, migration is a two-edged sword. While it may bring new opportunities, migration often tears individuals loose from existing social networks with deleterious effects. Migrants must give up their familiar home and a network of relatives and lifelong friends who often provided valuable financial, health care, and other support.[41] It is no wonder that much migration is movement back to the embrace of such social networks.

Population Size and Growth

Whether a population grows or wanes, the changes can be traced to the net effects of the three demographic processes discussed above: fertility, mortality, and migration.

Fertility adds members to the population and mortality removes them. Thus, the annual number of deaths in a population can be subtracted from the annual number of births to find the net number of persons added through **natural increase.** In 1990, there were 2 million more births than deaths in the United States. Worldwide, there were 93 million more births than deaths.

The death rate can be subtracted from the birth rate to find the **rate of natural increase.** The crude death rate for the United States in 1990 was

Box 4

The Demographic Balancing Equation for the World and the United States (numbers in thousands)

	Starting Population, 1990	+ (Births	- Deaths)	+ (Immigrants	- Emigrants)	= Ending Population, 1991
		Natural Increase		*Net Migration*		
World	5,245,071	+ (142,959	- 50,418)	+ (NA	- NA)	= 5,337,612
		92,541				
United States	248,168	+ (4,179	- 2,162)	+ (853	- 160)	= 250,878
		2,017		693		

NA: Not applicable
Source: Based on data from the Population Reference Bureau, the U.S. Bureau of the Census, and the National Center for Health Statistics.

9 deaths per 1,000. Subtracting this from the U.S. birth rate of 17 yields a rate of natural increase of 8 per 1,000 or as it is more commonly expressed, 0.8 percent. The world death rate was also 9 in 1990; however the world birth rate, at 27, was much higher than the U.S. rate. Thus, the world's rate of natural increase was 1.8 percent, twice the U.S. rate.

The rate of natural increase is added to the rate of net migration to yield the overall population growth rate, as summarized by the population balancing equation (see Box 4).

Population growth can be positive, as it is in most national populations; negative, as it was for the city of Detroit in the 1980s; or zero, as it currently is in Denmark.

The rate of growth can be used to estimate a population's **doubling time,** the number of years until the population will double assuming a constant rate of growth. Doubling time can be estimated by dividing the number 70 by the growth rate expressed as a percent. For example, a population growing at 2 percent annually would double in 35 years, one growing at 1 percent would double in 70 years.

World and National Populations

World population in 1990 was 5.2 billion and was growing at a rate of about 1.8 percent annually. World population is growing today because births exceed deaths by a wide margin, as shown in Box 4. Net migration, of course, is not a factor in world population growth, and it never will be unless space colonization becomes a reality. Nearly 1 billion more inhabitants will be added to the Earth before the end of the 20th century, and another 4 billion by the middle of the 21st century.

The actual size of the Earth's population in 2000, 2050, or thereafter is unknown. But demographers can make projections, which are really educated guesses about future population size. Population projections are based on assumptions about the future number of births and deaths (and immigrants and emigrants for country populations) for each future year. The projected population size for any future year can be determined by summing the estimated population growth for each year in the interval and adding that sum to the current population.

Using these basic principles, the United Nations recently projected that world population in the year 2025 will reach 8.5 billion, using what they deemed the most likely fertility and mortality trends. The U.N. also published upper and lower limits for the population in 2025, ranging from 7.6 billion to 9.4 billion.[12]

China is the world's most populous nation with a 1991 population of 1.2 billion. Its population is increasing by 1.4 percent each year. India, with fewer inhabitants (860 million) but a

higher growth rate (2.0), is catching up. If these rates continue, there will be as many Indians as Chinese by the end of the 21st century.

In the 1990s, most of the world's fastest growing countries are in Africa. Kenya's 1991 population of 25 million is increasing at 3.8 percent annually, meaning that it could double in only 18 years if there is no significant decline in birth rates. The population of the entire region is growing at nearly 3 percent, yielding a doubling time of only 23 years.

In contrast, many countries are experiencing extremely slow growth or even natural decline. In both Hungary and Germany, deaths exceeded births in the late 1980s.

The Population of the United States

The United States is the fourth most populous nation in the world, trailing only China, India, and the Soviet Union (as of fall 1991). The U.S. population increased by an estimated 2.7 million people during 1990 because the number of births and immigrants exceeded the number of deaths and emigrants. Note the relative contribution made to growth by natural increase and net migration

Households and families are the primary units through which individuals relate to society.

Box 5

Households and Families

Households and families are the primary units through which individuals relate to society. When the characteristics of these units change (in terms of their numbers, the age or the marital status of their members, for example) there can be profound social and economic consequences. Household characteristics, in turn, while highly sensitive to the age structure of the population, also reflect social and economic changes. An economic squeeze may prolong the time adult children live at home; a rise in the divorce rate may increase the number of single-person households; and relaxed social rules about marriage may boost the number of unmarried couples setting up house.

A household is composed of the person or persons who occupy a housing unit. Households may be one of two types: family or non-family. Family households include two or more individuals who are related by birth, marriage, or adoption; although they also may include other unrelated persons. Non-family households consist of people who live alone or who share their residence with unrelated individuals.

In the United States, the mix of household types has changed enormously over the last two decades. One of the most notable changes is the drop in the proportion of family households. In 1970, 81 percent of all households were family households, but by 1990, this had dropped to 71 percent. This decline occurred primarily because so many more people are living alone. Americans are waiting longer to get married, if they choose to marry at all. Married couples are more likely to get divorced than they were in the past. More of America's elderly are living alone after the death of a spouse. All these social trends produced increasing numbers of single-person households. In 1990, 25 percent of all U.S. households consisted of just one person, compared with 17 percent in 1970. Many European countries have seen a similar rise in single-person households for pretty much the same reasons.

The profile of the shrinking pool of family households is changing as well. Married-couple families accounted for 79 percent of all U.S. families in 1990, down from 87 percent in 1970. Married-couple families with dependent children also constitute a shrinking proportion of all U.S. families. Their share dropped dramatically between 1970 and 1990, from 87 percent to 72 percent. At the same time, the percentage of such families headed by a single woman doubled, from 12 to 24 percent.

in Box 4. The latter, which includes both legal and illegal immigration, contributed just over one-fourth of the population growth in 1990 and about one-third of the growth during much of the 1980s. Because fertility and mortality are expected to remain at relatively low levels in the United States, the most volatile demographic variable driving future growth is immigration.

According to Census Bureau projections, the U. S. population could reach a peak of 309 million around 2040, and then start to decline, falling back to 292 million by 2080.[43] But we should remember that these projections are based on speculation about future trends in fertility, mortality and migration.

Population Composition

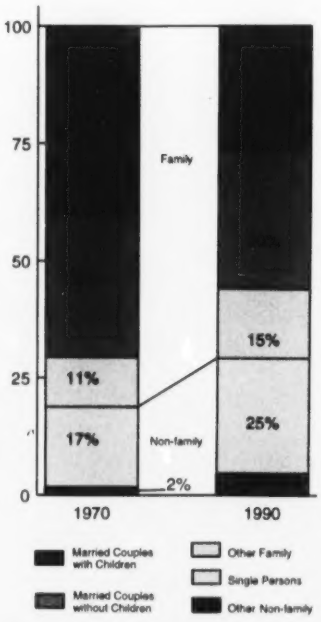
People have many characteristics that have demographic dimensions including their sex, age, race, ethnicity, occupation, education, religion, and marital status, and living arrangements (see Box 5). A population has corresponding characteristics constructed from personal traits of individual members. The age compo-

The coming of age of the U.S. baby-boom generation hastened many of the changes in the makeup of U.S. households. When the baby boomers reached adulthood, they moved out of their parent's homes and set up their own households, often alone or with housemates. They married later than the previous generation. They were subject to higher divorce rates. And, there were so many of them. The number of Americans in the 30 to 34-year age group grew by 89 percent between 1970 and 1990 as the baby boomers entered these age groups. But the number of households headed by a person in this age group grew more—98 percent—primarily because of the changes in marriage, divorce, and living arrangements. Americans born after the baby boom are delaying marriage even longer. Thirty-one percent of women who were 25 to 29 in 1990 had never been married, compared with only 21 percent of women in this age group in 1980 and 11 percent in 1970. The choices these women make about marriage and childbearing will help determine the future makeup of U.S. families and households.

References:

1. U.S. Bureau of the Census, *Current Population Reports* P-20, No. 447 (Washington, DC: GPO, 1990); *Current Population Reports* P-20, No. 450 (Washington, DC: GPO, 1991); *Statistical Abstract of the United States 1990* (Washington, DC: GPO, 1990).

U.S. Households



sition of a population, for example, is determined from the collective ages of all its members. This *Bulletin* focuses on age, sex, race, and ethnicity because these characteristics are fashioned solely by the prime demographic forces of fertility, mortality, and migration.

Age and Shape of Societies

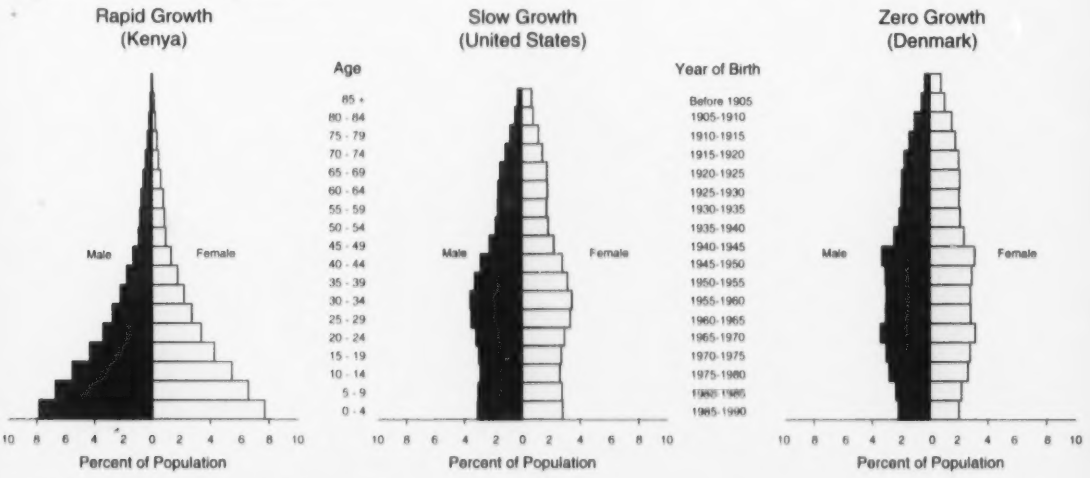
The age composition of a society can be depicted by a population pyramid, a figure that shows the proportion of the population in each age group. Notice in Figure 5, for instance, that about 18 percent of the population of Kenya is under age 5, while only about 4 percent is over age 65. The sum of the proportions in all age groups equals 100 percent of the population.

There are three general types of population pyramids: rapid growth, slow growth, and near zero growth. A rapid-growth population is the only one that really looks like a pyramid because each age cohort is larger than the one born before it. This pyramidal shape results primarily because of high fertility. If couples in one generation average eight children, for example, their children's generation will be about four times larger than their own generation. Thus, the pyramid would be about four times as wide at the base as in the middle. These pyramids also get their distinctive shape because of high mortality in the past. The older age groups have relatively few surviving members and occupy a relatively small section of the pyramid. The base is broadened by the fact that mortality, particularly infant mortality, is declining. This results in a larger proportion of the younger birth cohort surviving to the next age group.

Because the vast majority of people in rapid-growth societies are young, there is tremendous momentum for future growth because this large pool of young people are the parents of the future. Even if they only have four children apiece (the average for less developed countries), their children's generation would be twice the size of their own. Kenya's population age structure is typical of a young, rapid-growth society.

Nearly stationary populations such as that of Denmark look more like rectangles than pyramids. Each cohort is about the same size as every other

Figure 5
Age Patterns of Population



Source: U.S. Bureau of the Census and the United Nations.

one because the birth rate and the death rate have been low and relatively constant for a long time. This means that each age group is about the same size at birth and, since relatively few people die before old age, the cohorts remain close in size until late in life when mortality rates must rise and eat away at the top of the rectangle. Because a relatively high proportion of people in near-stationary populations are old, these populations are called "old" societies. They are at or near zero population growth.

A slow-growth population is generally in the process of changing from a rapid-growth to a near-stationary shape in response to changes in fertility and mortality. The United States is typical of these "middle age," slow-growth societies.

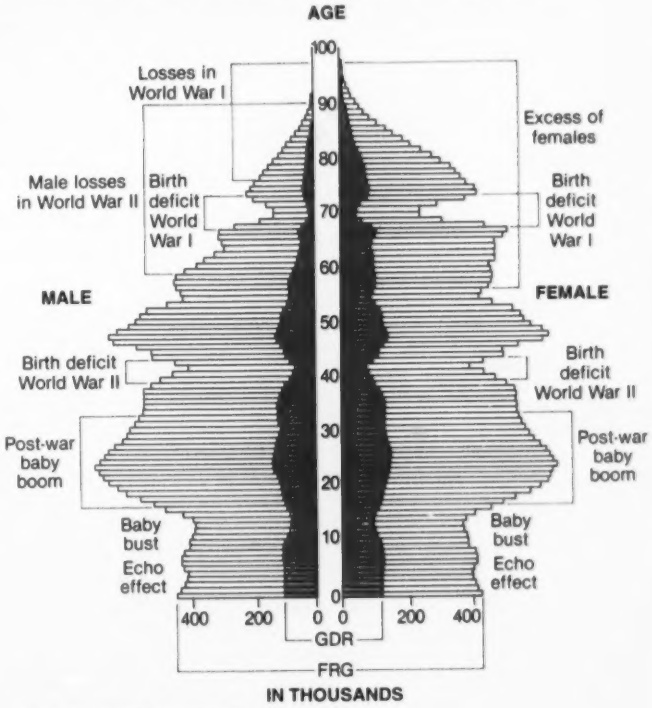
Population pyramids also can be shaped by migration. Since migration is age-selective, it alters the shape of both the place-of-origin and place-of-destination pyramids. In general, since migrants tend to be disproportionately young, the place-of-origin pyramid grows older, and the place-of-destination pyramid grows younger. But there are plenty of exceptions to this rule. The pyramid of the state of Florida, for example, has grown older because of the influx of retirees.

Migration can also be sex-selective, as it is for labor migrants in the Middle East. Oil-producing United Arab Emirates, for example, brings in thousands of men to work in its oil industry.

Pyramids also reflect historical events—wars, famines, baby booms or busts, or changes in immigration policies—that have affected one of the three demographic variables. Consider the tumultuous events portrayed in the pyramid for Germany in Figure 6.

Figure 6

Germany's Population by Age and Sex, 1989



NOTE: FRG = West Germany, GDR = East Germany
Source: Population Reference Bureau.

Median Age

Population pyramids depict the general shape of a population's age structure, but do not provide rates or measures that can be compared over time or with other populations. One such summary measure of age composition is the median age—the age at which exactly half the population is younger and half is older. In general, developing societies have rapidly growing populations with low median ages, while advanced societies have slow-growing or near-stationary populations with high median ages. For example, in 1990, Jordan had a median age of 16 compared to 37 for Denmark.[11]

Because more than three-quarters of the world's population lives in developing societies, the Earth's overall age structure is young. Thus, the Earth is primed for rapid population growth over the next century even if world fertility declines to a two-child family average.

The United States

The age structure of the United States looks more like a bowling pin

than a pyramid (see Figure 5). This shape resulted from drastic swings in the number of births, from the historic low of the 1930s, to the baby-boom peak of 1957, down to the baby-bust low of the mid-1970s, and back to the baby boomlet of the 1980s and early 1990s. The pyramid's middle-age bulge is composed of the baby-boom cohorts which are making their way up the structure as time passes. The baby-boom bulge has been likened to a swallowed pig moving through a python.[45] The narrower base is made up of the baby-bust cohorts born since the late 1960s. Each year the U.S. population gets older, primarily because of the aging of the baby boomers and continued low fertility. Continued increases in average life expectancy also has contributed to the aging of the population. The U.S. median age was 32.3 in 1988, up from 27.9 in 1970. The median age could rise as high as 46 in the 21st century.[46]

CLEO PHOTOS

Effects of Age Composition

The age structure of a society has a profound impact on its demographic and social character. Some of these impacts have been noted already–for example, the effect of age structure on population growth and on the average age of a society. But the effects of age structure are so pervasive it is almost impossible to summarize them.[47] Perhaps a few additional examples will suffice.

In 1985, the Soviet Union amended its military draft law to include women aged 19 to 40 because the pool of eligible young men was declining as a result of continued low fertility.[48] Similarly, the aging of U.S. society will have wide-ranging effects on everything from education to health care, the job market, and even funeral industry stocks. Since baby boomers are now moving into middle age and their parents into old age, it is inevitable that "elder care" issues will gain momentum. The elderly may compete with children for the private and public resources required to provide comprehensive care. Indeed, the aging of America may be the most significant challenge this country faces in the next half century.

Age composition is relevant to many seemingly unrelated social problems. As the U.S. baby-boom generation has passed through its life cycle, it has faced shortages in schools, housing, and employment. Excess supply often has been left in its wake, because by the time the economy had geared up to meet the needs of the baby boomers, they had

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passed on to another phase in their life cycle.

Similarly, the magnitude of a social problem may increase or decrease simply because of changes in the age composition of a society. As the proportion of elderly people increases, so does the proportion who are chronically ill, all other things being equal. Theoretically, rates of violent crime should decline as the percentage of the population ages 18 to 24 (the age group most often involved in crime) edges downward between 1990 and 2000. Changes in age composition can alter the severity of a social problem even if there is no change in the underlying causes.

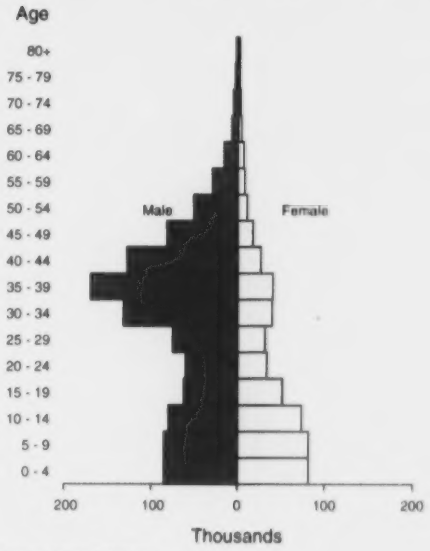
Sex Composition

Population pyramids also show the relative proportion of men and women in each age group. Small differences are difficult to discern, but some are obvious. Consider the bite out of the male side of Germany's pyramid for those aged 60 to 90. This reflects the military casualties of World War II, as well as longer female life expectancy.

But the sex composition of a population can be summarized best by the sex ratio: the ratio of males to females. This ratio is usually expressed as the number of males for every 100 females. The world's sex ratio in the late 1980s was 101, or 101 males for every 100 females. The ratio for advanced societies was 94; for developing nations, 104. A few countries have extremely high sex ratios. The United Arab Emirates, for example, had a sex ratio of 218 in the late 1980s—more than two men for every woman.

Sex ratios are determined by the now familiar forces–fertility, mortality, and migration. The influence of migration on the sex ratio is easiest to assess. The unbalanced sex ratio of the United Arab Emirates (UAE) came about because the UAE had brought in thousands of foreigners from Asia and other parts of the Middle East to work in its oil fields. Nearly all these labor migrants were men unaccompanied by their families. The effects of this selected immigration pattern is evident in the population pyramid for the UAE shown in Figure 7.

Figure 7
Unbalanced Sex Ratio: United Arab Emirates, 1985



Source: United Nations.

Mortality influences the sex ratio because of the sex differences in death rates at nearly every age. The sex ratio at conception may be as high as 150, but a male fetus is more likely than a female to be miscarried or stillborn. The sex ratio at birth ranges between 103 and 106 in most regions of the world. It then begins an inexorable descent in most societies because more males than females die at every age. In the United States, the ratio of men to women is about equal (the sex ratio is 100) between ages 25 to 29. By ages 50 to 54 it has dropped just below 95, and for the 85 and over group, the sex ratio is only 39. This preponderance of females at the older ages can be seen in the top bars of the U.S. pyramid.

Fertility affects the sex ratio by controlling the proportion of young people in a population. Any force that increases the relative proportion of young people in a society—as does a

high fertility rate—raises the overall sex ratio of the society because the sex ratio is higher in the younger ages. A rapid drop in infant and child mortality, for example in response to large scale inoculation campaigns or the importation of modern medical technology, also contributes to the "younging" of a population. Conversely, any force that decreases the relative proportion of young people—such as high mortality or low fertility—lowers the overall sex ratio.

In some nations, however, cultural factors override the biological advantage that women usually have. In Indian society, for example, women are accorded a low status. Girls receive less food, medical care, and familial attention than boys, and they die at higher rates.[49] This discrimination is reflected in the sex ratio of India—estimated at 107 in the late 1980s. Sons are highly valued in many other Asian countries as well, often to the detriment of daughters. The sex ratio for all of South Asia is 107, compared with 100 in Latin America, also a developing region.

An unbalanced sex ratio in the young adult years–due to migration, fertility swings, or war casualties, for example–means that there may not be enough men or women for everyone to get married.

Effects of Sex Composition

Why does the sex ratio matter? One reason is its affect on the availability of marriage partners. An unbalanced sex ratio in the young adult years—due to migration, fertility swings, or war casualties, for example—means that there may not be enough men or women for everyone to get married. But a scarcity of potential marriage partners is not merely a personal disappointment for individuals who really want to get married, it affects the social, psychological, and economic structure of society.[50] Marriage rates, childbearing practices, family stability, and even the comparative status and power of women and men can be influenced by the sex ratio.

In the United States, for example, the annual increases in the number of births during the baby boom created a "marriage squeeze" in the 1970s and 1980s by producing more women than men in the prime marrying ages. This phenomenon, along with the continued mortality gap between the sexes, has been linked to many of the changes in the American family since the 1960s: increasing numbers of single women, rising age at marriage, falling fertility, increasing rates of divorce, growing rates of out-of-wedlock childbearing, rising female employment, and increasing female earnings.[51]

Sociologist William Julius Wilson has argued that a shortage of marriageable black males in poor ghetto areas is partially responsible for the dramatic increase in out-of-wedlock births and female-headed families among African Americans.[52] In these areas, the pool of black men who could support a family has been depleted by high rates of unemployment and incarceration, and the high mortality rates for young black men.

Similarly, the sex composition of immigrant groups has a bearing on the speed and ease with which they adjust to their new society. An immigrant group containing more men than women, for instance, may compete with native men for marriage partners. This possibility, even if it never happens, invites resentment and even social disorganization.[53]

Racial and Ethnic Composition

Many population characteristics are fluid. A person's age increases constantly, and educational attainment and marital status can change over time. Other characteristics are fixed at birth, like gender. Race and ethnicity fall into the second category. But although an individual's ancestors cannot change, the way societies evaluate and classify them is highly variable. Societies differ in their definitions of race and ethnicity, as well as in the political and social significance of these variables.

What are race and ethnicity? The two terms are often used interchangeably, but there are technical differences between them. Race is often defined in terms of a person's physical characteristics, such as skin color, hair or facial features. Ethnicity, on the other hand, emanates from cultural characteristics,

Box 6

Where Do Demographic Data Come From?

Demographers use a variety of rates, ratios, and other measures to study population. But these measures are only as accurate as the data from which they are calculated. Where do these demographic data come from? How accurate are they?

Most demographic measures are based on **counts** of people or demographic events (for example, births) in a specific area during a specific time period. There were 248,709,873 residents in the United States during 1990, for example, and 1,730,000 births in Iran. Counts come from population censuses, vital registration systems, national registers, and surveys. Their accuracy varies greatly by country and even by region within countries.

The **population census** forms the cornerstone of demographic analysis. In many countries the census—an enumeration of all households —is the main source of national population data. During the 1980s, about 94 percent of the world's population was covered in a national census. But censuses usually miss a small percentage of the population, especially in hard-to-enumerate areas such as the mountains of Turkey or poor ghettos within some U.S. cities.

The population characteristics censuses record also are subject to error. Residents may lie about their income or forget the exact ages of some household members.

Vital events—births, deaths, marriages, and divorces—are usually recorded in **national vital registration systems**. These are the source of the counts used to calculate fertility, mortality, marriage, and divorce rates. But in countries in which mothers give birth at home, or where many residents are illiterate, a large proportion of vital events are never recorded. Less than half of the world's population lives in countries that have "complete" vital registration systems. Even "complete" systems may miss up to 10 percent of a country's vital events.

A few countries have comprehensive registration systems, or **national population registers**, that track individuals from birth to death and record changes in their residence or marital status.

Surveys often provide estimates of demographic events where registration systems are inadequate and aid in developing estimates of population size during the long interval between censuses. Surveys usually collect data for a sample group within a specific geographic area. In the United States, a monthly national survey is used to track the unemployment rate as well as many demographic indicators. But surveys suffer from many of the same accuracy problems as censuses and registration systems, and their data are subject to varying degrees of error.

Demographers have developed statistical techniques to overcome some of the shortcomings of the basic data with which they work. They apply these techniques to the best data available to compute **estimates** of the actual population counts and measures. Although estimates based on good data can be quite accurate, users of these estimates should not forget that estimates are only approximations of the true number.

Likewise, users of demographic data always should question the source and quality of the data that underlie the rates, ratios, and proportions they cite. Judging the quality of data is one of the most important skills demographers must learn. Indeed, everyone would benefit from taking a hard look at the myriad of statistics we encounter daily. "In a world where people are very numerous and where many people use numbers to convince others to behave in certain ways, a responsible citizen has no choice but to become numerate as well as literate."[1]

Reference

1. Carl Jay Bajema, "Garrett James Hardin: Ecologist, Educator, Ethicist and Envrionmentalist," *Population and Environment* 12, no. 3 (Spring 1991), p. 196.

such as language, religion, country of origin, or even clothing, food, and family relationships. In popular usage, the terms are socially, not scientifically, defined.

The United Nations publishes data on ethnic composition reported by individual countries, but warns that they are "a series of categories which are not uniform in concept or terminology....By the nature of the subject, these groups vary from country to country—no internationally relevant criteria can be recommended."[54]

On U.S. census forms, residents are asked to identify themselves as belonging to 1 of 15 "race" groups: white; black; American Indian; Eskimo; Aleut; 9 Asian and Pacific Islander categories (including Japanese, Samoan, and Filipino); and Other.

Changes in racial and ethnic composition come about through differences in the fertility, mortality, and migration of individual groups.

Table 2

U.S. Total and Hispanic Populations by Race, 1990

Race	U.S. Population	U.S. Hispanics
Total Population (in millions)	248.7	22.4
Percent	100	100
White	80	52
Black	12	4
American Indian, Aleut, and Eskimo	1	1
Asian and Pacific Islander	3	1
Other	4	43

Source: 1990 U.S. Census.
NOTE: Percentages may not add to 100 because of rounding.

The second largest U.S. minority group, Hispanics, is missing from this list. Hispanics are considered an ethnic group, like Italians or Poles, not a race. Although the majority report themselves as white, Hispanics may be of any race. For example, many Filipinos identify themselves as Hispanic, and many Dominicans and Puerto Ricans in the United States are Hispanic, but also of African ancestry. A substantial number of Hispanics report their race as "Other."

Although exact definitions are elusive, race and ethnicity remain important variables in the demography of the United States and most other countries. The relative size of individual groups often helps determine their political power and social and economic status. Shifts in racial and ethnic composition can alter the prevailing social structure and foment prejudice and social unrest. Lying behind such problems is the basic concern that some other group will grow faster than one's own and, consequently, increase its share of the population and its importance within the society.

Changes in racial and ethnic composition come about through differences in the fertility, mortality, and migration of individual groups. Major shifts in racial and ethnic composition are occurring in countries throughout the world. In South Africa, whites are becoming an ever-smaller minority owing to a lower birth rate and a higher emigration rate than blacks. In northern Ireland, Protestants are losing their majority status because Catholics are having more children. In Israel, the Arab population is growing much faster than the Jewish majority. If this continues, the Arabs will become the majority in Israel early in the 21st century.[55] And in many European countries, immigrant groups from third world countries are growing faster than their hosts, leading to anti-immigrant backlashes.[56]

The United States

Racial and ethnic diversity has been a hallmark of the United States since colonial times. Waves of immigrants from different parts of the globe, and differential fertility and mortality between those groups and native-born Americans has kept the racial and ethnic composition in flux. This uneven growth continues, driven by the current differences in fertility, mortality, and migration discussed in earlier sections. If present trends continue, white non-Hispanics eventually will become a minority

group in the United States, perhaps by the second half of the 21st century. While most U.S. residents now trace their ancestry to Europe, by 2050 the majority may trace it to Latin America, Asia, Africa, the Middle East, or the Pacific Islands.

African Americans are still the most numerous U.S. minority group, but they now account for less than one-half of the total minority population. Because of greater immigration and higher fertility, Hispanics will outnumber blacks early in the 21st century, becoming the nation's largest minority group. Asians will move from a trace element to a sizable minority. It is unlikely that any single racial or ethnic group will outnumber white non-Hispanics in the near future, but white non-Hispanics may fall from being the majority group to being the largest of several large racial/ethnic minority groups.

The evolving ethnic composition is already having a profound impact on almost every aspect of American society, from social values and culture to education, politics, and industry. More public schools must teach non-English speaking students, and in most big city school districts, white non-Hispanics are already a minority. Some universities have been charged with having covert racial quota systems for admissions, a phenomenon that serves as a reminder that building and sustaining a multiracial society is difficult and fraught with social problems.

Population Distribution

Where do the earth's 5 billion inhabitants live? Demographer's answer this question by keeping tabs on the distribution of population by world region, by country, by province or state within countries, by urban and rural area, and by neighborhood within cities. The geographic distribution of population is, once again, determined by fertility, mortality, and migration.

World Population

Population is unevenly distributed among the world's regions, and because of the disparate growth rates discussed in the population growth section above, distribution is becoming more unbalanced. The developing regions encompassed two-thirds of the world population in 1950 and just over three-quarters in 1990. And, according to World Bank projections, these regions will contain 85 percent of world population by 2025, and nearly 90 percent by 2100.[57]

Although fertility is the primary cause of the uneven population growth rates among world regions, migration does play a role. Indeed, international migration is at an all time high in the 1990s. Movement occurs from the less affluent developed nations to the more affluent ones, for example from Portugal to France, and from the poorer developing nations to relatively prosperous ones (from Colombia to Venezuela). But the most significant movement is from third world nations to developed countries.

Population is unevenly distributed among the world's regions, and because of the disparate growth rates . . . distribution is becoming more unbalanced.

Nevertheless, although migration is at an all-time high, only about 1 percent of the Third World's population growth—just the growth, not the population itself—is absorbed by the developed nations through this process.[58]

A major feature of population redistribution in the Third World is urban growth. The urban population of these nations rose from 286 million to 1.5 billion between 1950 and 1990. About 60 percent of this urban growth was caused by natural increase, the difference between the number of births and deaths of current city dwellers (both those born in the city and those who migrated there). The rest of the urban growth occurs because of rural to urban migration.[59]

One conspicuous consequence of this growth is the proliferation of jumbo-sized cities in the Third World. In 1950, Shanghai was the only third world city with a population of more than 5 million. But the U.N. predicts that by the year 2000, there will be

Figure 8
Metropolitan Areas in the United States, 1990

Source: Population Studies Center, University of Michigan.

over 40 such cities including 19 with more than 10 million inhabitants.

Rapid population growth quickly overwhelms the public services and housing supply in these cities, not to mention the supply of jobs. Millions of residents cope by building makeshift shelters on open land and trying to make a living on the streets, often creating their own informal economic and social systems. Gigantic shantytowns have sprung up around major cities throughout the Third World, a testament to the explosive growth in these cities.

The U.S. Population

Like world population, the U.S. population is unevenly distributed. More than half the U.S. population lives within 50 miles of a coastal shoreline.[60] Mountains, deserts, and long distances, in conjunction with unrelated economic factors, have limited population growth in many parts of America's middle section.

Population density, the number of inhabitants per square mile, ranges from 1,035 in highly urban New Jersey to one in Alaska, the loneliest place in America. Many sections of America's heartland are sparsely populated. Wyoming has only 454,000 people, fewer than Austin, Texas, and 26 other U.S. cities.[61] Parts of Minnesota are so eager to populate that they offer free parcels of 40 acres to individuals willing to settle there.[62] Yet the midwestern states of Illinois, Ohio, and Michigan rank sixth, seventh, and eighth in population size, compared with the other 50 states.

The most populous region of the country is the South, with 34 percent of the population, followed by the Midwest (24 percent), the West (21 percent), and the Northeast (20 percent).

The distribution of the U.S. population is always changing because of geographic differences in natural increase and net migration.

International and internal migration have always been the main determinants of redistribution, but natural increase also plays a role. Utah, which has among the highest fertility and longest life expectancy of any state, experienced an 18 percent population growth during the 1980s solely because of natural increase. Net migration was negative during the decade–more people moved out of Utah than moved in.

International migrants settle disproportionately in certain states and communities, often close to their port of entry into the United States. Indeed, the U.S. Immigration and Naturalization Service reports that about 70 percent of all newly-arrived immigrants live in just six states: California, Texas, New York, New Jersey, Florida, and Illinois.

Within the United States, migrants tend to follow several long-established migration streams. The first stream flows from the eastern seaboard states westward, a demographic process that has occurred since colonial times and that ultimately pushed the American frontier out to the Pacific Ocean. This process continues today. The second stream runs from rural to urban areas. In 1910, 35 percent of the U.S. population lived in metropolitan areas. By 1990, about 78 percent of the U.S. population lived in metropolitan areas, 50 percent in areas with 1 million or more inhabitants (Figure 8). A third major migration stream surfaced during the depression years, and led from economically depressed areas in the South to the cities of the Northeast and North Central states. This southern exodus included millions of African Americans during the middle decades of the 20th century. Beginning in the 1970s, however, there has been return migration to the South with net in-migration of blacks and an even greater influx of other Americans. This phenomenon is part of the fourth and now major stream, the movement from the Snowbelt states to the Sunbelt states.[63]

More dramatic and more rapid than regional shifts in population is the redistribution of population within and around metropolitan areas. City neighborhoods can change fundamentally within a decade, from middle-class family homes to densely populated ghettos of non-English-speaking immigrants. Rolling farmland 30 miles from downtown can sprout dense townhouse developments. Because these changes affect a community's tax base, public school enrollment and student-body composition, traffic congestion, and public services, they often spark contentious political battles.

The Census Bureau has detailed definitions for metropolitan areas and their constituent parts—central city and suburb, for example, and combinations of these parts (such as Consolidated Metropolitan Statistical Area or CMSA). As growth patterns, as well as the socioeconomic relationships among the components of metropolitan areas change, definitions change. After each decennial census, metropolitan areas in the United States are redefined, usually by expanding them to include adjacent counties. In 1990, there were 284 metropolitan areas defined by the U.S. Census Bureau, ranging in population size from 57,000 (Enid, Oklahoma) to 18 million (New York City and environs).

After each decennial census, metropolitan areas in the United States are redefined, usually by expanding them to include adjacent counties.

The major facts regarding the population growth and change within metropolitan areas can be summarized as follows:

- metropolitan areas have grown faster than nonmetropolitan areas for all of this country's history except for the 1970s;
- within metropolitan areas suburban areas have grown more rapidly than central cities (indeed, many central cities such as Philadelphia have been losing population for several decades); and
- metropolitan areas continually expand outward from original central cities, gobbling up additional cities and counties in their path. (Los Angeles, for instance, has more incorporated cities within its sprawl than do some states.)[64]

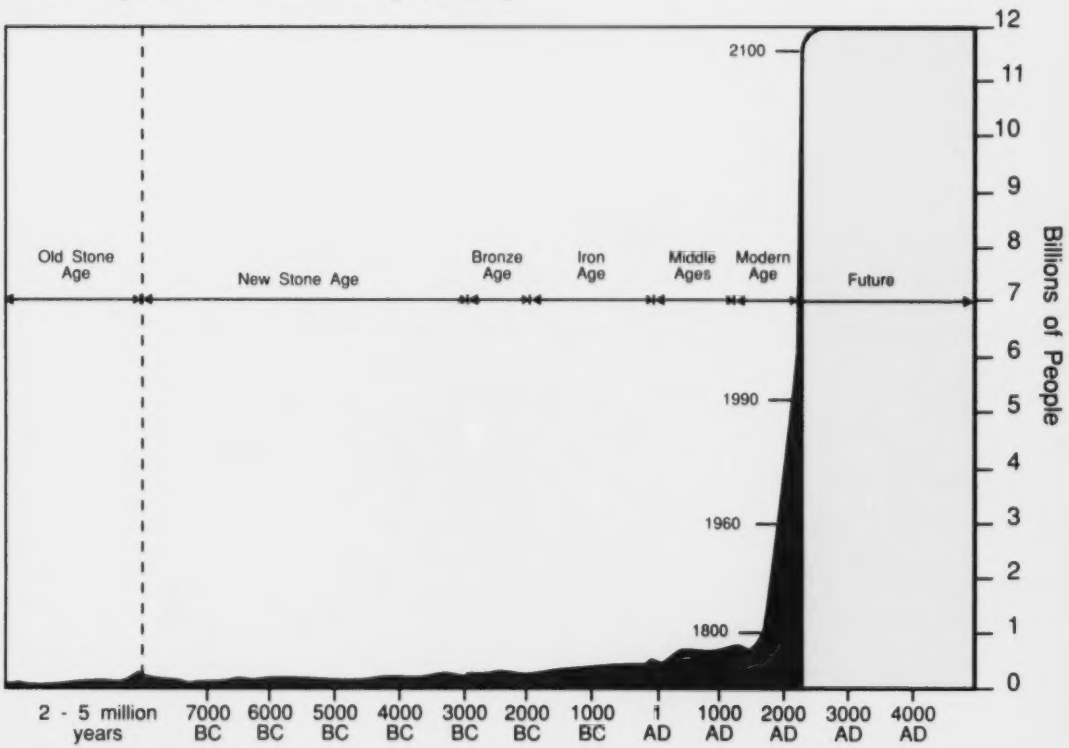
Population distribution and redistribution affect the demographic composition of the areas involved, with many social consequences. For example, the high rate of migration into Florida of both immigrants and internal migrants in the 1980s has not only moved that state from seventh to fourth place in population rank, but has fundamentally altered the state's age, racial, and ethnic composition. Similarly, the flight from central cities to the suburbs is predominantly a movement of the middle- and upper-classes, thus leaving behind groups that are disproportionately poor. With respect to blacks, William J. Wilson argues that the urban poor lost an important source of social and economic support when middle- and upper-class blacks moved out of central cities.[65]

Population Growth Issues

The Population Explosion

During the first 2 to 5 million years of human history, world population never exceeded 10 million people. Because the death rate was about as high as the birth rate, the rate of population growth was scarcely above zero. Significant population growth began about 8000 B.C., when humans began to farm and raise animals (see Figure 9). Because of improved nutrition and a more settled lifestyle, death rates began to fall. By 1650 world population had expanded about 50 times—from 10 million to 500 million. Then world population

Figure 9
World Population Growth through History



Source: Population Reference Bureau.

shot up another 500 million people in just 150 years, reaching its first billion around 1800. It added a second billion by 1930, after only 130 years; a third billion by 1960, only 30 years later; a fourth billion by 1975, just 15 years later. The fifth billion, reached in 1987, took only 12 years. World population will exceed 6 billion by 2000, and another billion persons will be added every 11 to 13 years until about the middle of the 21st century. It took all of human history for the world's population to reach the first billion, now each new billion is added in just over a decade.

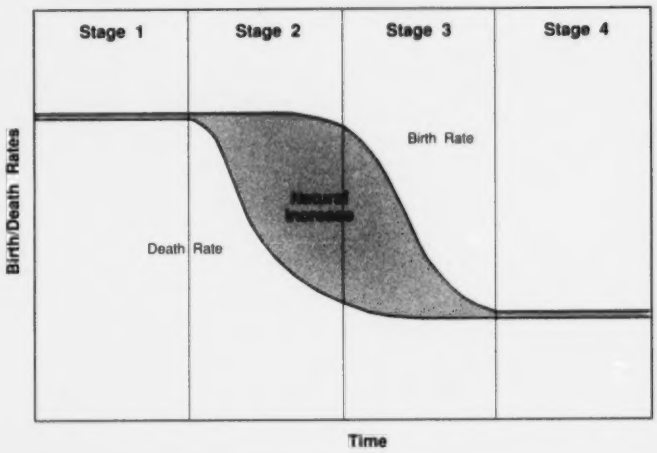
But the population explosion, as it is often termed, is not just an awe-inspiring accumulation of people. It has a myriad of other demographic and societal consequences such as massive international migration and the proliferation of gigantic cities with mammoth shantytowns. Indeed, while a few population scholars downplay the negative impact of population growth,[66] most believe that population growth multiplies the damage created by other world problems.[67] For example, population growth exacerbates environmental degradation and resource depletion, and puts unmanageable pressures on government institutions, national economies, and virtually all other resources.

Population growth is not solely responsible for these social problems. Environmental degradation, for example, is brought about not only by the number of people, but by how much they consume and the degree to which their consumption damages the environment. Poverty often is produced by an uneven distribution of income within a country, not just large numbers of people. Solving these social and economic ills generally requires direct action by policy-makers. Just slowing population growth will not solve such problems, but it contributes to their solution.

Demographic Transition

The unprecedented growth of world population in the modern era resulted from the change in the ratio of births to deaths. Prior to this, the birth rate and the death rate fluctuated around a relatively high level (Figure 10), essentially canceling each other out. This formed the first stage of a process called the demographic transition. The death rate was high in these societies because of poor health and harsh living conditions. Life expectancy at birth was less than 30 years. If birth rates had not also been high, societies would simply have died out–and many did!

Figure 10
The Stages of Demographic Transition



The cultures in these societies encouraged high birth rates through religious teachings and social pressure, essentially encouraging people to "be fruitful and multiply." Socially, a man's virility and a woman's status often were linked to the number of children they had. But large families also served a practical function in these societies—furnishing labor for family farms and providing support for parents during old age. Collectively, large families also increased the economic, political, and military power of the tribe or nation.

Stage two of the demographic transition began when the death rate began to drop in response to improved living conditions and health practices. But the birth rate continued at or near its stage one level, thus

igniting the population explosion. Note that the population explosion came about as a result of lower mortality rather than higher fertility.

Why didn't the birth rate fall in tandem with the death rate? Most societies eagerly accept technological and medical innovation and other aspects of modernization because of their obvious utility against the universal enemy: death. However, the social value attached to high fertility is slower to change. Cultural lag also plays a role. It takes time for people to recognize that lower death rates create population pressures that can be eased by having fewer children. It can take generations to recognize, for instance, that it is no longer necessary to have eight children to ensure that four will survive to adulthood.

The rapid decline in death rates without a coincident fall in birth rates ignited the unprecedented explosion in population growth in the developing world beginning in the 1950s and accelerating in the 1960s.

In the third stage of the demographic transition the birth rate moves downward, eventually catching up with the death rate. Population growth remains relatively high during the early part of the third stage, but falls to near zero in the latter part.

In the fourth and final stage of the demographic transition the birth rate and the death rate are close together again, but they fluctuate around a relatively low level as shown in Figure 10. Natural increase is close to zero.

The theory of the demographic transition evolved from the history of population growth in Europe and the United States. With their current low levels of population growth, nations such as the United States have largely completed the demographic transition. But most developing nations are still in stage two or the early part of stage three of the transition. Excluding China, the growth rate for developing societies in 1990 was 2.3 percent. If growth continues at that rate, the population of these countries will double in only 29 years.

Will developing countries eventually complete the demographic transition to low fertility and mortality? Most population experts assume they eventually will, although the process and even the end result may differ from the European experience.

The developing countries already have deviated from the path followed by Europe and the United States as they passed through the demographic transition. The importation of medical supplies and technology caused death rates to plummet in many parts of the Third World after World War II; in contrast, mortality declines in Europe occurred very slowly. The rapid decline in death rates without a coincident fall in birth rates ignited the unprecedented explosion in population growth in the developing world beginning in the 1950s and accelerating in the 1960s. Many developing countries, such as Mexico, Brazil, and Thailand, experienced dramatic declines in birth rates in the 1980s, aided by the availability of modern contraceptives. Yet fertility has remained stubbornly high in most of Africa and in many Asian and Latin American countries, prompting many demographers to question whether the demographic transition is an appropriate model for the contemporary Third World. Others debate just what actions or policies, such as improving the educational levels of women or making contraceptives easily available, will initiate or accelerate declines in the birth rate. Even if all countries eventually undergo the transition to low fertility and mortality, it is clear that individual countries are following very different timetables. The timetable for completing the demographic transition has enormous long-term consequences: This will determine the ultimate size of the world's population.

Future Prospects

If the present rate of population growth were to continue, world population would rocket to 10 billion by 2030, 20 billion by 2070, 40 billion by 2110, 80 billion by 2150, and so on. Indeed, humanity would outweigh the earth and then the solar system in a remarkably short period of time if the present high rate of growth continued indefinitely. But no

rate of growth can be sustained indefinitely. A positive growth rate of +.00001 ultimately would yield a population whose mass would expand at the speed of light, while a negative rate of -.00001 ultimately would carry humanity back past Adam and Eve.[68] Zero population growth (ZPG), which characterized human population for more than 99 percent of its history, must be achieved once again, at least as a long-term average, if the human species is to survive.

In order for the world to reach ZPG (assuming that mortality remains low or sinks lower as most demographers expect), the global TFR would need to drop from its present 3.4-child average to a two-child per woman average—replacement level fertility.

This cannot be attained immediately for two reasons. First, it is not likely that fertility in all countries will fall to replacement levels immediately. Fundamental social changes in childbearing behavior require time. Second, the world's present age composition will generate massive growth even if a relatively small family size becomes the worldwide norm in the near future.

Over one-third of the developing world's inhabitants presently are below age 15, and they inevitably will parent the largest birth cohorts in history. But, like any explosion, the population explosion will eventually fizzle out, probably by the end of the 21st century. By then, the demographic transition will have run its course in most countries of the world. A world growth rate near zero probably will be attained at that time as well. Most recent estimates of how large the world population will be when it stops growing are in the 11 to 13 billion range.

Can the Earth support such huge populations? The Earth's ultimate carrying capacity is unknown. As new technologies are devised and as resource management techniques are improved, the carrying capacity of the Earth expands, making it impossible to predict the ultimate number of people the world can support. However, many experts think that a world population of 10 billion may be the maximum that

could be supported comfortably.[69] Other scholars believe that the world's basic biological systems—its forests, grassland, croplands, and fisheries—and its oil resources are insufficient to maintain a population of 10 billion. They foresee major systems failures long before the 10 billion mark is attained and predict that societies will be forced to restrict individual childbearing to stabilize growth.[70]

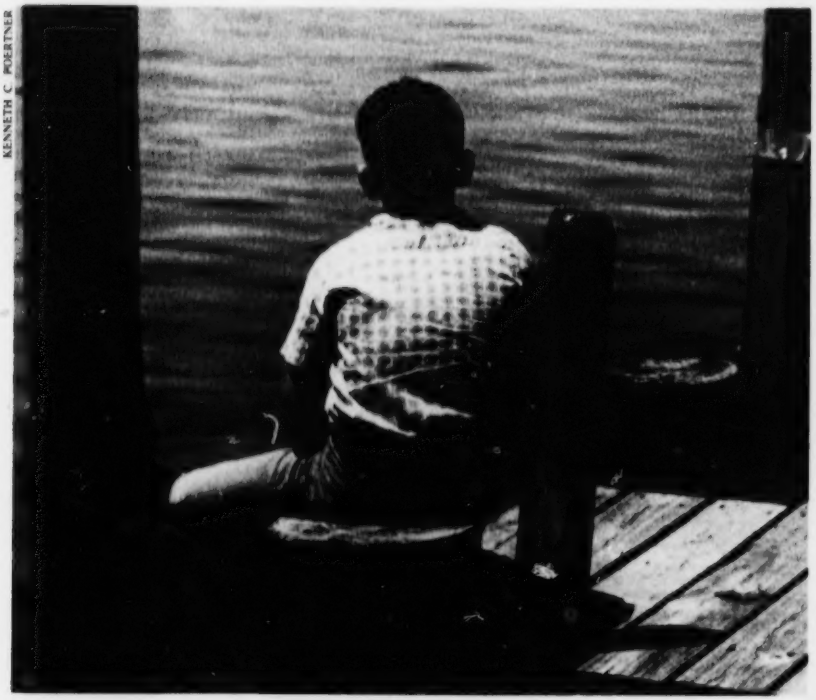
Whatever the peak carrying capacity of the Earth, world population might stabilize and remain uncomfortably close to that maximum level once population growth has ceased. Or, more optimistically, world population might decline to a lower, more manageable level for both humans and environment.

Negative Population Growth

There is no homeostatic mechanism that maintains a society at ZPG once it is reached. Societies can easily pass through ZPG and slip into negative population growth (NPG). Indeed, some population experts and interest groups would welcome such a population implosion.

But zero growth or population decline bring their own set of problems. One is that the population ages markedly; that is, the proportion of the population made up of older people rises dramatically. Older people consume a disproportionate share of medical and other costly public services. Labor force shortages also may develop. Most population scholars agree that if population decline is gradual, the negative effects of such problems are manageable. But if the down-sizing is rapid, the social and economic problems can be severe.[71]

Natural decrease (fewer births than deaths) is already a reality in Hungary and Germany. Most other European countries are at or near ZPG. One Council of Europe demographic study projects that there will be only half as



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many Europeans in 100 years as there are today.[72] Many European leaders fear that their declining populations will threaten their economies, their defense systems, and even their national identities. Various economic incentives to raise birth rates have been tried. In some European countries, couples receive housing or other benefits if they have children, and women on maternity leave are paid a percentage of their salaries and guaranteed a job. But these incentives are expensive and they have not managed to boost fertility enough to ward off population decline. Massive immigration is not viewed as an acceptable solution to population decline in most countries. Indeed, virtually all European countries have imposed strict restrictions on immigration. Some countries have tried to stimulate the return migration of resident immigrants.

Stringent government regulation of the number and timing of childbearing is not acceptable in most contemporary societies. The pronatalist policies now in place are considered long shots, and long-term population decline–or what has been termed "the second demographic transition"–appears inevitable for most of Europe.[73] Were it not for high immigration levels, the United States also would face negative population growth in the 21st century.

Concern about Population

The reader no doubt has noticed that many social problems emanate from the population processes of fertility, mortality, and migration. These include the scarcity and waste of social resources caused by baby booms and busts; premature death, especially in certain demographic subgroups; the heavy concentration of population in some urban areas and depopulation in rural areas; social disturbances caused by changes in a population's racial and ethnic composition; and the threat of declining quality of life for present and future generations because of continued world growth. The damage such problems produce is indisputable.

Americans are moderately interested in population problems. They have very general opinions on such issues as the desirability of population growth, the appropriate amount of immigration, and the "ideal" racial and ethnic composition of the population. But public concern about such issues does flare up occasionally. For example, during the 1980s concern rose sharply over the flow of legal and illegal immigrants into the United States. Polls indicated that Americans strongly favored imposing limitations on immigration and completely terminating illegal movements into the country.[74] This heightened concern was caused in part by the weak economy in the early 1980s, which raised fears of increased job competition, and to the media attention focused on immigration issues.

During the 1980s concern rose sharply over the flow of legal and illegal immigrants into the United States.

Nevertheless, most Americans do not view population problems as among our most serious social problems. Population problems typically lack the dramatic event—the startling calamity or outrageous incident—that galvanizes attention and action. Rather, they develop slowly and inconspicuously through the processes of birth, death, and migration.

Experts themselves often have disagreed on the severity of population problems. Debate about overpopulation has been going on at least since Aristotle, who cautioned that populations could outstrip their subsistence base, leading to poverty and social discord.[75] Thomas Malthus reached a similar conclusion in the late 18th century. He argued that the natural consequences of population growth are poverty and misery because the food supply cannot grow as fast as the population. On the other hand, Karl Marx and Friedrich Engels rejected this Malthusian view in the 19th century. They blamed poverty not on the poor or overpopulation but on the evils of social organization in capitalist societies. Overpopulation in their view was a natural feature of capitalism, and would not exist in socialist societies

because socialism would provide enough resources for each person or motivate couples to reduce family size when resources were scarce.[76]

Today, the debate over overpopulation continues. Media articles on world population growth vacillate from doomsday hysteria to complacent unconcern depending on which experts are used as the source.

The recent upswing in concern about environmental problems has brought more attention to the consequences of continued world population growth. Commitment to the environment is the most deeply and widely held value among Americans, according to Gallup research; and this commitment increasingly is being extended to population issues.[77]

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Expectations also play a role in determining the level of public concern about population problems. For example, when concern about the population explosion or population decline flares up, people tend to believe that the rate of growth—whether positive or negative—will continue until people are standing on each other's shoulders or until no one is left.[78] Such expectations, however, underestimate a society's ability to solve problems through social change.

Conclusion

The study of population dynamics involves the interplay between the three sources of population change: fertility, mortality, and migration. These variables determine the most basic characteristics of a population, as well as its demographic future. The unprecedented population growth that has taken place within the 20th century may abate toward the end of the 21st century. For the foreseeable future, however, the world will continue to grow and people will move to new regions and countries looking for a better life, giving demographers ample subject matter for study.

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Discussion Questions

1. How do the intermediate variables help us understand fertility? How do they relate to socioeconomic variables such as education?

2. Why is the crude birth rate more easily obtained than the total fertility rate (TFR)? For what purposes is the TFR a more useful measure?

3. What social trends since the 1950s may have pushed the age-specific fertility rate for women aged 25 to 29 above that for women aged 20 to 24?

4. How is the measure of life expectancy similar to the TFR?

5. What are some practical applications of a life table?

6. How does HIV (AIDS) affect differences in life expectancy between black and white Americans and between men and women? Which age groups are most affected? Answer the same questions for at least one other major cause of death in the United States.

7. Find out the number of in-migrants and out-migrants there were for your state during the 1980s. Discuss their impact on growth, the economy and society.

8. Make a chronology of the residential changes you have experienced in your lifetime. Compare reasons for moving, distances of the moves, and the people involved.

9. Examine some of the "push" and "pull" factors in a selected immigration stream.

10. Discuss other social and economic consequences of migration for both the sending and receiving locations. Consider both internal and international migration.

11. Give specific examples of how changes in the age structure affect public expenditures.

12. Give examples of current global conflicts that may be wholly or partially driven by the racial and/or ethnic composition of a society.

13. Will the present trends in fertility, mortality and migration lead white non-Hispanics to become a minority group in the United States? Explain how this could happen.

14. What social, economic, historical, and demographic factors have driven recent shifts in U.S. population distribution? Consider population shifts between metropolitan and nonmetropolitan, central city and suburban, and from region to region (for example, from the Northeast to the Sunbelt). Discuss the consequences of these changes.

15. Name some specific interventions in the Third World that led to the decline of the death rate in the second stage of the demographic transition.

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